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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Jea Gun Park

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EXAMINER

ANGADI, MAKI A

ART UNIT

PAPER NUMBER

1792

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/540,992	<b>Applicant(s)</b> PARK ET AL.	
	<b>Examiner</b> Maki A. Angadi	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 05 June 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 June 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>4/2/07, 6/28/05</u> .   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1-2 are rejected under 35 U.S.C. 102(b) Grover (US Patent No. 5,759,917).

*As to claim 1*, Grover discloses a chemical-mechanical-polishing (CMP) slurry composition polishing and ablating an oxide layer selectively in relation to a nitride layer (col.2, lines 21-27), the CMP slurry composition containing ceria polishing particles (col.2, line 34, line 60) and anionic dispersing additives (col.6, line 40-45), and the anionic additive serves to control the selection ratio of an oxide layer to nitride layer from 5 to about 100 or more (col.7, lines 9-13).

*As to claim 2*, Grover discloses a CMP slurry composition wherein a particle size of the ceria polishing particles is within the predetermined range (col.5, lines 3-1, col.7, lines 59-61, Example 2).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claim 3-5, are rejected under 35 U.S.C. 103(a) Grover (US Patent No. 5,759,917) as applied to claim 1 above in further view of Akahori (EP 1148538).

*As to claim 3*, Grover discloses precipitated cerium oxide particles from a variety of precursors in the range of about 10 nm to about 500 nm which (col.5, lines 2-11) but is silent about its polycrystallinity. However, Akahori discloses the use of cerium oxide particles in the CMP slurry, which are polycrystals (paragraphs, 0015, 0044, Table 1-1, page 9). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select cerium oxide abrasives that are polycrystalline because Akahori illustrates

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that the cerium oxide particles in polycrystalline form with smaller aggregates (5 nm-300 nm) tend to minimize polishing flaws (paragraph 0015).

*As to claims 4 and 5*, Grover discloses the presence of anionic additives (col.6, line 40-45) but is silent about water-soluble polyacrylic acid or water-soluble polycarboxylate in the CMP slurry. However, Akahori discloses water-soluble polyacrylic acid (paragraphs 0019-0020) in the CMP slurry and the anionic additive from 0.01-2 wt% (paragraph 0026). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select anionic additives in the slurry employed by Grover because Akahori illustrates that anionic additives improve storage stability (paragraph 0011) and flatness of the polished surface of a substrate (paragraph 0012).

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b)The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 6-8, 10-12, 14 and 16-17 are rejected under 35 U.S.C. 102(b) over Kido (EP 1061111)

*As to claim 6*, Kido discloses a method for planarizing a surface of a semiconductor device (paragraphs 0001, 0002) that includes steps that read on: preparing a semiconductor substrate (paragraph 0011) in which a level difference nitride layer (3) is formed on the upper surface of the substrate (1) (Fig.1); depositing an oxide layer (5) for filling the level difference and planarizing the surface of the semiconductor substrate so that a predetermined thickness of the oxide layer can be added to surface of the nitride layer (paragraph 0011 and 0028-00230); ablating/polishing the oxide layer by a CMP process so as to expose the surface of the nitride layer (Fig.3) (paragraph 0031); CMP process uses CMP slurry that includes ceria polishing particles (paragraph 0015-0018), a dispersing agent and anionic additive (paragraph 0019-0022) so that a polishing rate selection ratio of oxide layer to nitride layer is 40:1 or greater (paragraph 0026 and 0033).

*As to claim 7*, Kido discloses the level difference is a trench (4) formed on the surface of the semiconductor substrate (1) (Fig.1) (paragraph 0030).

*As to claim 8*, Kido discloses step of polishing oxide layer by CMP process in which silicon slurry is used (paragraph 0045, Table III, page 9).

*As to claims 10 and 16*, Kido discloses the use of water-soluble organic compound such as polyacrylic acid (paragraph 0019 and 0021) in CMP slurry.

*As to claims 11 and 17*, Kido discloses the concentration of anionic additive is from 0.005 of 5 wt% (paragraph 0022), which covers the ranges suggested by the applicant.

*As to claim 12*, Kido discloses that the oxide layer is silicon oxide layer and the nitride layer is silicon nitride layer (paragraph 0011).

*As to claim 14*, Kido discloses a method of controlling selection ratio of CMP slurry composition (Table I-III) wherein the method includes a step of confirming the polishing rate (Table I-III, Examples 1-23) selection ratio of the oxide layer to the nitride layer, while a particle size of the ceria polishing particles is changed (paragraph 0016-0017).

#### ***Claim Rejections - 35 USC § 103***

4. Claim 13 is rejected under 35 U.S.C. 103(a) over Kido (EP 1061111) in view of Grover (US Patent No. 5, 759,917).

Kido discloses a method of controlling a selection ratio of a CMP slurry and polishing an oxide layer selectively in relation to a nitride layer (paragraph 0011), the method includes the steps that read on: selecting ratio of an oxide layer to a nitride layer of a CMP slurry (paragraph 0026-0027) which include ceria polishing particles (paragraph 0015-0018), dispersing agent (paragraph 0019), concentration of anionic additive is changed (paragraph 0022).

Kido discloses the process of adjusting the concentration of ceria additive to attain a desired selection ratio of the slurry composition on the basis of the polishing-rate selection thereby controlling the selection ratio of the composition (paragraph 0022, Examples 1-23, Table I-III, pages 7-9) but is silent about adjusting the concentration of anionic additive to attain the desired selection ratio.

However, Grover discloses the process of adjusting the anionic additive to adjust the selectivity (Tables 3-5, Examples 5-7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the concentration of anionic additive to attain the desired selection ratio because Grover illustrates that the concentration of anionic additive improves the within-wafer-non-uniformity of the wafers and hence reduce wafer defects (col.6, lines 45-48).

***Claim Rejections - 35 USC § 103***

5. Claim 9 and 15 is rejected under 35 U.S.C. 103(a) Kido (EP 1061111) as applied to claim 6 above, in further view of Akahori (EP 1148538).

Kido discloses cerium oxide polishing particles in the polishing slurry (paragraphs 0017-0018) but is silent about its polycrystallinity.

However, Akahori discloses the use of cerium oxide particles in the CMP slurry, which are polycrystals (paragraphs, 0015, 0044, Table 1-1, page 9).



Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select cerium oxide abrasives that are polycrystalline because Akahori illustrates that the cerium oxide particles in polycrystalline form with smaller aggregates (5 nm-300 nm) tend to minimize polishing flaws (paragraph 0015).

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Tsuchiya (US Patent No. 6, 530,968) discloses CMP slurry.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maki A. Angadi whose telephone number is 571-272-8213. The examiner can normally be reached on 8 AM to 4.30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair->

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/Maki A Angadi/  
Examiner, Art Unit 1792